DEC 2 1964

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U. S. DEPARTMENT OF AGRICULTURE

Forest Service

Intermountain Region

1964

SOME FACTS ABOUT FOREST PROTECTION FROM PESTS

Limited Distribution

FOREWORD

Forest insects and diseases are ranked nationwide as the principal destructive agents of timber. Combined, they destroy 7.3 billion board feet of timber annually and cause a loss in volume growth of 21.2 billion board feet. The timber destroyed by pests each year is roughly equivalent to half the present annual cut from the National Forests and is four to five times the amount destroyed by fire. Young trees and reproduction also sustain high but immeasurable losses even more serious than the destruction of old growth because they are the Forests of the future. Thus, forest protection is a two-sided blade: one to protect the supply of sawtimber and other forest products for the immediate years, and one to assure forests for future generations.

The Region's National Forests are vital to its economy and sustained protection is essential to maintain a healthy industry. Thus, protection indirectly helps stabilize dependent communities and the price of forest products. Equally as important, it preserves the esthetic and scenic values of the Forests, protects the wildlife habitat and the watersheds, and prevents costly timber salvage programs from areas on which the timber crop has been destroyed.

The threat of forest pests is constantly with us but through combined vigilance, skillful attack, and continuous additions to our knowledge on how best to combat them, the damage they cause can be held to the lowest possible levels with the least possible impact on other resources. Control costs are high but weighed against values being protected, they usually are judged well worth the expenditure of public funds.

I. THE OBJECTIVES AND BENEFITS OF FOREST PROTECTION FROM PESTS

Objectives

* To provide a sustained supply of wood products.

* To protect useable water for hydroelectric power, industrial and domestic use, and fish and aquatic life habitat.

* To protect meadows, grass, brushlands, and other forage areas for wildlife and domestic livestock.

* To provide a suitable habitat for fish and wildlife.

* To provide scenic areas for camping, vacationing, and recreation.

* To reduce resource-threatening insect infestations and forest diseases to the lowest possible level consistent with public safety, high economy, and good multiple use land management.

* To test promising new control methods, screen new safer pesticides and biological suppression agents, to study carefully any indications of damage to other resources, and to adjust control techniques to prevent it.

* To conduct all pest control activities safely without loss of life and at the most favorable public cost benefit ratio.

Benefits

* Forest esthetic and wildlife habitat values are protected.

* Timber stumpage values ranging from $100 to more than $1,000 per acre are protected.

* Sustained allowable timber harvest can be maintained. Community stability is aided.

* A costly crash timber salvage program yielding lower quality lumber is avoided.

* Forest fire hazards are reduced through the preservation of living trees. A forest of standing and down dead timber presents a high fire hazard, an impediment to game and livestock use, and a hazard to travel.

II. PUBLIC REGULATORY CONTROL OF PESTICIDES

Regulation of the use of pesticides in agriculture and forestry dates from the adoption of the Federal Insecticide, Fungicide, and Rodenticide Act of 1947. This was followed by the 1954 Miller Amendment to the Federal Food, Drug, and Cosmetic Act. These laws acknowledge the tremendous expansion of pesticide use to meet the needs for increased agricultural and natural resource production. They provide the controls necessary for the production of an adequate, wholesome, and less expensive food supply and for public protection in the handling and use of insectides.

To be considered suitable for use, a pesticide must pass laboratory tests demonstrating: (1) its effectiveness against specific pests when used as proposed, (2) an absence of harmful effects against the plants or trees on which it is used, (3) safety for preserving the productivity of the soil and the beneficial soil organisms, and (4) preservation of the quality of the products being protected.

In addition to the above action, the Federal Government has taken further steps to protect water values, wildlife and fish resources in forests, or other areas being sprayed. Tests called bioassays are made of all pesticides licensed for use. These tests, in which animals and fish are used, ascertain such effects as sensitivity, toxic dosages, effects on skin, eyes, and other organs, and physical and mental effects generally.

The protection by the public of fish and wildlife resources was given further impetus by passage September 16, 1959, of Public Law 86-279, providing for continuation in the Department of the Interior of studies "on the effects of insecticides, herbicides, fungicides, and other pesticides upon fish and wildlife for the purpose of preventing losses of those invaluable natural resources....."

In 1961, an International committee of European and American scientists was organized to coordinate research on the harmful effects of pesticides on wildlife. The same year the President of the United States set up an interdepartmental "Pest Control Review Board" to evaluate all pesticide application programs to insure proper precautions and wise use of pesticides. This Board reviews all United States pest control projects contemplated on State and Federal lands. Membership includes the United States Department of Agriculture, Department of Defense, Department of the Interior, and the Department of Health, Education, and Welfare. The National Academy of Sciences has established a Pest Control and Wildlife Relationship Committee to work out a sound National program of plant protection without causing permanent damage to useful animals and fish.

In addition to research on the effects of pesticides on wildlife and fish in the United States Fish and Wildlife Service, many local agencies are conducting independent research. The United States Department of Agriculture is devoting two-thirds of its research program to biological controls, the use of specific chemicals, attractants, and basic insect physiological and pathological research.

Three-fourths of the United States Forest Service pest control research expenditures are directed to reduce or eliminate harmful effects of chemicals on wildlife and human beings. Included are the use of predators, parasites, resistant tree-breeding, cultural measures, and improved techniques for applying chemicals.

During preplanning phases of pest control projects, the pesticide to be used is carefully selected, its potential effectiveness thoroughly screened, and the effects on wildlife, fish, and other resources critically examined. All these factors are weighed and the control strategy planned cooperatively around the outcome of these studies. In Section III, the careful appraisal of an entire 1964 control project will be reviewed.

III. WHAT A PEST CONTROL PROJECT RECOMMENDATION INVOLVES. THE CURRENT INFESTATION CYCLE AND BASIS FOR CONTROL RECOMMENDATION.

This Section will trace the background leading to the present recommendation for the 1964 Spruce Budworm Project on the Salmon National Forest, depict the resources involved, and relate something of the careful planning done prior to field control.

The story begins back in 1958 when Regional entomologists observed increasing spruce budworm populations in several National Forests contiguous to the Salmon and Snake River headwaters. By 1960 in the Salmon and Targhee National Forest areas, 10,000 acres of Douglas-fir-true fir timber were heavily damaged. The infestation also extended over 226,000 acres of light to moderate damage. The following year, 1961, 430,000 acres of timber were showing serious damage and the light to moderately damaged area had grown to 554,000 acres.

Heavy damage sustained by the trees means nearly complete defoliation in any one year. Two or more years of successive defoliation are frequently sufficient to kill a larger tree. Small trees and reproduction can be killed by a severe defoliation in one year. Thus, considerable losses may be sustained in a timber area receiving severe damage for more than one year.

The 1961 situation was as critical as any that had previously faced the Region. Control measures were recommended using the same methods employed to suppress a similar epidemic successfully in 1955-1957. A control project proposal was sent to the Chief's Office of the United States Forest Service in the fall of 1961. However, because of the higher priority of other insect infestations in timber in other parts of the Region and the United States, the project was bypassed.

By the fall of 1962 the Targhee-Salmon National Forest epidemic had grown to involve 1.6 million acres, about half this area being severely infested, with losses imminent in the sawtimber and heavy losses in reproduction. A decision was made to secure financing for about three-fourths of a million acres of the most serious infestation. The Federal Pest Control Review Board had evaluated the project in the spring of

1962 and reviewed it again in the spring of 1963 before approval. Certain adjustments were made to provide greater protection for the other resources. Then in May, the Congress appropriated funds to finance the first phase in control of the insect by aerial spray.

Control measures in 1963 were extended to 234,500 acres on the Targhee and Salmon National Forests and adjacent areas as follows:

Targhee National Forest	190,000 acres control area	Idaho
Targhee National Forest	10,000 acres test area	Idaho
Salmon National Forest	16,500 acres test area	Idaho
U.S.D.I., BLM lands	18,000 acres control area	Montana

As apparent from the above listing, the 1963 Spruce Budworm Control Project was executed in two phases; the first of which was to test the adaptability of aerial spray techniques developed to protect aquatic resources and fisheries values. This 16,500 acre test was carried out on the Salmon National Forest, June 30 through July 3. The second phase, comprising the control operation itself began July 10 and continued through July 24. Included in this phase was the spraying of 190,000 acres on the Targhee National Forest and 18,000 acres of infested Bureau of Land Management timberlands adjoining. In addition, on the Targhee National Forest a 10,000 acre preliminary test was conducted to appraise the effectiveness, specificity, and safety of Sevin, a newly recommended pesticide. The test was ineffective because of heavy rains directly after spraying.

Post project checks showed spruce budworm mortalities ranging from 66 to 99%, with an overall reduction on the one-half pound per acre areas of 91%. On the areas receiving one pound per acre, reductions averaged 97%. Experience has shown that 95% or better mortality provides adequate control.

Total project costs were $1.23 per acre including tests for developing spray procedures.

The spray pattern tested on the Salmon National Forest was as follows:

1. No spray within 100 feet of selected streams, lakes, or reservoirs.

2. In a 300 foot zone occurring between 100 feet and 400 feet from the water's edge, one-half pound of pesticide per acre was applied by helicopter for maximum control of spray deposit.

3. Beginning 400 feet from the water's edge, a 600 foot strip was sprayed by fixed-wing aircraft at a rate of one-half pound of pesticide per acre.

4. On the remainder of the infested area, beginning 1,000 feet from the water's edge, one pound of pesticide per acre was applied by fixed-wing aircraft.

The Resource Values

1. Douglas-fir and true fir timber. The present Salmon River infestation covers about 1.6 million acres on the Salmon, Challis, Payette, Sawtooth, Targhee, and Boise National Forests. This area represents a sawtimber volume of several billion board feet with a stumpage value of between 15 and 20 million dollars and lumber value exceeding 400 million dollars. A recent extensive timber survey on the Salmon National Forest indicates over 600 million board feet of Douglas-fir-true fir susceptible timber volume. A large part of this is currently infested and is included in the control program for 1964.

2. The young trees and reproduction included in the sawtimber areas are much more susceptible to kill. This is very serious because they represent our forests of the future.

3. Watersheds, which are principal headwaters for the Salmon and Snake Rivers.

4. Forest scenic and recreation resources for the people in 78 communities lying within the infestation zone or tributary to it and for thousands of visitors annually from all parts of the country.

5. Soil, which supports the Forests, is the basic resource.

6. The headwaters of the Salmon River contain important Chinook salmon spawning grounds.

7. Rich trout and salmon fishing resources attract people from adjoining States and from all over the United States by the hundreds and thousands.

8. Elk, deer, moose, and mountain sheep provide excellent wildlife resources.

9. Boating down the Middle Fork of the Salmon River and down the Salmon River is considered a supreme sport, nationwide.

10. The area is rich in birdlife, including several of the extremely rare trumpeter swans.

11. Adjacent to the control area are many diversified farms, including dairying and fruit raising.

12. Domestic livestock grazing is a major local industry, the National Forest rangelands providing an important segment of the yearlong forage supply.

Needless to say, the problem of control on an area so rich in human and natural resources is difficult. The timber resource must be protected without causing significant damage to all the other resources.

Evaluation of Possible Control Choices

Several options are available:

1. DDT. Very effective against spruce budworm proven on several major control projects involving millions of acres of forest lands in the West and in Canada. Its side effects are well-known and the Forest Service is more familiar with its use than any other pesticide. Costs of application run from $0.75 to $2.00 per acre, depending on methods of application used.

2. Sevin. This material shows promise but no adequate field tests have yet been made. A decision was made to test its effectiveness against spruce budworm on 10,000 acres of the Targhee National Forest in 1963. However, heavy rains shortly after application invalidated the tests.

3. Phosphamidon. Another promising pesticide that possesses systemic qualities. It is highly toxic to mammals, but tests have shown it less hazardous to fish than DDT. Cooperative field tests are proposed to check its suitability. It is expensive, costing probably one and one-half to two times more per acre to spray forest land.

4. Bacillus thuringiensis. The cost is high, running about $15 per acre and little is known of its effect on spruce budworm. Application is highly complicated and technical. It is being tested. It may be highly selective with few side effects.

5. Do Nothing. This is a poor choice because scenic and recreation values are destroyed, growth of timber is reduced, lumber production is curtailed, fire hazards are increased, watershed values are lost, and reforestation is many times more costly than protection. The old adage of "a stitch in time saves nine" applies here.

All these possibilities, as well as others, for control are weighed carefully against the values at stake and the objections of the United States Forest Service before a selection is made. Then the pattern of control is designed around the pesticide's characteristics and qualities.

The Approved Project

After due consideration and approval April 2, 1964, by the Federal Pest Control Review Board, the 1964 spruce budworm project has been designed as follows:

Project Area - 500,000 acres, Salmon National Forest
Gene Powers, Forest Supervisor, Salmon, Idaho

Approximate Dates - June 20 to July 15, 1964

Drainages Affected - Panther Creek, North Fork, and Horse Creek and some small streams draining into the Salmon River from the north. The entire project is tributary to the Salmon River.

Control Pattern - (Devised for maximum protection of fishing values)

1. Nonspray Areas. (to compensate for slope along streams)

   a. A 100 foot strip along streams having bank slopes under 60%.

   b. A 200 foot strip along streams having bank slopes from 60% to 100%.

   c. A 400 foot strip along streams having bank slopes of over 100%. (A 100% slope is a 45° angle)

2. Spray Areas.

   a. A 400 foot strip outside the nonspray area: Apply pesticide by helicopter at a rate of one-half pound per acre.

   b. Beyond the 400 foot strip: Apply pesticide by fixed-wing aircraft at a rate of one pound per acre.

Project Personnel - Project Leader - Clifford T. Solberg
Air Operations Officer - Robert K. Patee
Ground Operations Officer - Roger Taynton
Safety Officer - Orlo Johnson
I&E Officer - Lowell J. Farmer

IV. THE EFFECTS OF CHEMICAL SPRAYS

Many questions usually arise from people in, or adjacent to, spray areas and from agencies interested in the resources involved in the control project. Some of those questions most frequently asked will be considered here.

1. How does DDT affect insects or other organisms with which it becomes associated in the environment?

   DDT causes poisoning either through contact with the skin or through ingestion inside the organism. If consumed by an animal in continuing doses, the pesticide tends to accumulate in the tissues. However, if only one dose is applied, as in forest insect control projects, it may be temporarily stored in the tissues of other animals contacting it and gradually dissipate. Whereas insects, such as the spruce budworm, are easily killed on contact with minute amounts of DDT on the foliage, dermal applications to warmblooded animals are not normally hazardous. Insects are also easily destroyed through ingestion of the poison. Most of the effects on animals inhabiting spray areas are sustained through consuming pesticide on forage or other contaminated food.

2. How are the deposits and effects of pesticides measured by scientists?

In two ways; (1) through measurement of a quantity of pesticide ingested by an organism and (2) by measuring the amount of pesticide deposited either on the outside or the inside of the plant or animal.

This latter is expressed on a basis of number of parts of pesticide per million units of the sample material. The common abbreviation for parts per million is p.p.m. and this is frequently seen in reports of scientific studies on the subject. As an example of the way this factor is used, the United States Food and Drug Administration has set up a series of standard "tolerances" or parts per million of pesticide material permissible in marketed food materials. For example, an established tolerance for beef fat in marketed meat is no more than seven parts per million. This means that meat may contain no more then seven units of DDT in every million units of meat put on the market. Naturally, the agency has established this figure as a safe level for human consumption.

The accepted unit of measure for the effects of DDT on animals is LD 50. This means the amount of insecticide required to kill 50 percent of the test animals. It is measured in quantities of insecticide applied in relationship to the weight or the organism or animal. This relationship is expressed in milligrams of insecticide per kilogram of animal weight. For example, the oral LD 50 for laboratory animals ranges from 150 to 300 mg./kg., meaning that a dose of 150 to 300 milligrams of DDT per 1,000 grams of animal weight will kill half the test animals. This same ratio expressed in pounds would be .15 to .30 pounds of DDT per 1,000 pounds of animal weight. In other words, if one were to feed a 1,000 pound cow a third of a pound of DDT every day for a week the cow would have a 50-50 chance of survival.

3. If DDT gets into a stream, how long will it last?

Spray contamination in streams lasts only a short period. Studies have shown that the greatest amount of stream contamination has occurred within one-half hour after spraying at any one point and that within an hour after spraying contamination was considerably reduced.

Two things happen to spray in a stream:

a. It moves downstream with the waterflow.

b. It is diluted by mixing with water and becomes less and less dangerous as mixing proceeds by dispersing any concentrations of the material.

DDT has been recorded in stream water as far as ten miles below a sprayed area. The distance that detectable amounts may persist depends on the amount getting into the stream and the volume of water.

4. What is the effect of DDT on fish and other aquatic life?

Fish can be killed with as little as 0.01 parts per million in the water, aquatic insects with even less. However, the aquatic insects usually repopulate the streams in one to twelve months. Anadromous fish such as the ocean-going salmon in the headwaters of the Salmon River are very sensitive. These fish must rely on natural methods of regeneration. Such sensitivity requires great caution and careful preparation and handling of aerial application projects to preserve the resource within its natural environment. Special precautions devised to handle this situation on the current project are described in Part III.

It is known that DDT concentrations also accumulate in water algae and current studies are underway to determine how long the chemical remains in plant tissues.

5. How long will DDT last when deposited on forage?

Spray residue will persist for about 30 days on foliage. Where possible, milk cows should be kept away from sprayed forage for 30 days to prevent milk contamination. No hazard should exist for meat animals because designed spray application will not permit the building up in the fat tissue above the accepted tolerance level of seven parts per million.

6. How much Sevin or DDT would a person or an animal have to eat to cause damage?

No tests have been made of the toxic effects of these two chemicals on human beings. However, in one case, members of two families became ill after eating greens bearing residues of 3,200 parts per million of a chlorinated hydrocarbon. DDT is a chlorinated hydrocarbon. No deaths or permanent afflictions occurred.

Cows have consumed 200 parts per million of DDT in their diet for 18 weeks without serious ill effects.

Sevin is considerably less toxic. Tests have shown that it took 2,000 to 100,000 milligrams of chemical per kilogram of body weight to kill one young bird.

7. What is the effect of DDT on birdlife in the spray area?

   There is no evidence that one pound of spray per acre will have any effect on birds. This statement is from observation on many spray projects using the above concentration. However, spraying will kill many of the insects which provide food for birds. Shortage of food usually causes birds to leave the area.

8. Supposing some milk cows are accidentally sprayed or they eat some DDT on their forage. What would be the effect on the milk?

   To test the effect, some cows were turned into a sprayed pasture and the concentration in milk built up to nine parts per million. Aften ten days, two parts per million still remained.

   Cows turned into the pasture 14 days after spraying showed a maximum of concentrations of one part per million in the milk but none after ten additional days of grazing. Cows turned into the field 30 days after spraying showed no DDT residue in their milk.

   The Federal Food and Drug Administration will not permit milk to be sold if it contains any DDT residue.

9. How long would DDT last if stored in animal tissue?

   About 50 percent remains after one month, 25 percent after three months if no more DDT is consumed. The amount remaining stored in animal tissue depends upon the level of ingestion and the length of time over which the intake occurs. Large doses accumulate in the tissues more rapidly than small doses.

10. Is there an intake level at which no fat storage of DDT occurs?

    Accumulation in fat is possible from a one part per million level in the food.

11. Is age related to fat storage of DDT?

    Fat storage of DDT is at the same rate in weanlings and four month old rats.

12. What is the lowest level of intake at which DDT may produce pathological effects?

    Evidence of liver injury has been noted in rats consuming diets containing five parts per million DDT for four to six months.

13. How much DDT is sprayed at a one pound per acre rate?

    If the application rate is one pound per acre and the amount falls on one acre-foot of water, the DDT concentration in the water would be 0.375 parts per million.

14. Why aren't some safer controls developed, like the use of parasites, predators, or insect disease?

    Tests were conducted in 1963 on all spruce budworm control projects in the West to try to find a method by which budworm populations could be satisfactorily reduced with less danger to fish, wildlife, and man. Various specific biotic and systemic chemicals were tried. A wide research program on natural enemies continues, and safer methods of pesticide application are constantly being developed.

In reviewing the answers to the above questions, it must be remembered that specific information on the effects of pesticides is limited, primarily because the science of pesticide toxicology is a new science, much of it developed only since the advent of modern agricultural chemical industry after World War II. The above answers are based on the best information obtainable. There is a wide variation in test results, depending on the conditions under which the tests were made, and of course, no two control operations present the same set of conditions. This is the reason for developing an entirely new control system for each infestation or disease outbreak where resource protection is required in the public interest.

V. THE PUBLIC'S STAKE IN PEST CONTROL

Americans are the most efficient, productive people in the world. They continually direct their efforts toward producing crops, livestock, forest products, and other commodities on fewer acres with less labor and at lower cost. Nineteen out of twenty Americans live and work in towns and cities and are not involved with agriculture and forestry. These commodities in abundance have become an accepted way of life.

Here are a few reasons for this affluence:

1. Adequate quarantine services to prevent the introduction of foreign insect and disease pests.

2. Successful eradication programs for both pests, human, and animal parasites.

3. Cooperation among Federal, State, and private agencies in prosecuting research and eradication campaigns.

4. Chemical control measures.

5. Biological control measures.

6. Basic research programs.

7. Silvicultural and management controls.

Regardless of these measures and activities to hold pest losses to low levels, damage to agricultural crops and forest resources are costly, requiring the expenditure of between ten and twenty billion dollars annually. At the same time, the Nation enjoys the following results from expenditures to reduce pest damage:

1. The food and forest product dollar buys two to three times more than it would without pest protective measures.

2. Lumber is in good supply and cheaper than if a high rate of pest damage were allowed to continue.

3. Many foods and forest products would be luxury items were it not for pest controls.

As in other forest management and protection activities, control programs are coordinated with overall multiple use administration to insure balanced land management. For example, the application of a pesticide must be checked for any effect it may have on fish, wildlife, grazing animals, and humans utilizing the same areas. A ceaseless vigil is essential to detect threatening organisms. To maintain a healthy industry sustained on a continuous flow of products, is vital to the Region's economy. This in turn helps stabilize communities. Protection of the esthetic values and watershed functions are other dividends of a good insect and disease suppression program.

VI. THE REGIONAL ORGANIZATION FOR FOREST PROTECTION FROM PESTS

It is the function of the Regional Division of Timber Management to provide through the Regional Forester to the Forest Supervisors of the eighteen Intermountain National Forests adequate prevention, detection, and evaluation services for the destructive insect and disease pests, and to coordinate these and suppression activities with the respective State, private, and other Federal personnel. These services are centered in three sections of the Branch of Forest Insect and Disease Prevention and Control, 509 Kiesel Building, Ogden, Utah. Briefly, their activities are described as follows:

Detection and Evaluation Section:

1. Conduct annual aerial detection surveys, covering all Intermountain National Forest timbered areas as well as the Department of the Interior forested lands by cooperative agreement. Detection on State or other lands are made upon request and reported promptly.

2. Aerial surveys are followed by biological evaluations on the ground whenever suspected pest activities are detected from the air or reported by others. These evaluations appraise the current and potential significance of an insect outbreak.

3. Biological evaluations are made on other than National Forest lands upon request from other Federal, State, local, or private land managers or owners. Training services are also provided for personnel from these agencies.

4. An annual report and summary of current insect situations and potential is provided to all owners and managers of forest lands in the Region.

Insect Control Section

1. Secure or provide technical advice and assistance on insect control projects in Region Four and on other Federal, State, or private forest lands.

2. Maintain a comprehensive knowledge of modern pesticides, chemical and biological controls, and pest control equipment.

3. Guide operational ground surveys and handle biological problems encountered on control projects.

4. Report annually on recommended pest control projects and accomplishments.

5. Make inspections of control projects to assure that satisfactory control methods are followed and that control is effective.

Forest Pathology Section

1. Direct National Forest disease detection, evaluation, and surveys and advise feasible control measures.

2. Provide technical advice on diseases and assistance on disease control projects in the Region and on other Federal, State, or private lands.

3. Work cooperatively with other Forest Pathologists and disease control workers to reduce the overall disease potential.

4. Maintain a comprehensive knowledge of forest diseases, disease-insect relationships, and biological systemic disease controls.

5. Make inspections of control projects.

The Regional Forester by the above means, provides the specialized services and aids required by the Forest Supervisors on the eighteen National Forests of the Intermountain Region to accomplish the control within tolerable limits of the destructive array of forest pests. Prevention and control activities extend over nearly thirty-one million acres of National Forests and on other forest lands when the land managing agencies request these services. The Forest Pest Control Act of 1947, provides for the cooperative protection of all forest lands against forest pests as follows:

Federal Forest Pest Control Act of 1947

Public Law 110 - 80th Congress

Chapter 141 - 1st Session

(S. 597)

(61 Stat. 177)
An Act

To provide for the protection of forests against destructive insects and disease, and for other purposes.

Be it enacted by the Senate and the House of Representatives of the United States of America in Congress assembled, That in order to protect and preserve forest resources of the United States from ravages of bark beetles, defoliators, blights, wilts, and other destructive forest insect pests and disease, and thereby enhance the growth and maintenance of forests, promote the stability of forest-using industries and employment associated therewith, aid in fire control by reducing the menace created by dying and dead trees injured or killed by insects or disease, conserve forest cover on watersheds, and protect recreational and other values of forest, it shall be the policy of the Government of the United States independently and through cooperation with the governments of States, Territories and possessions, and private timber owners to prevent, retard, control, suppress, or eradicate incipient, potential, or emergency outbreaks of destructive insects and diseases on, or threatening, all forest lands irrespective of ownership.

Sec. 2. The Secretary of Agriculture is authorized either directly or in cooperation with other departments of the Federal Government, with any State, Territory, or possession, organization, person, or public agency, subject to such conditions as he may deem necessary and using such funds as have been, or may hereafter be, made available for these purposes, to conduct surveys on any forest lands to detect and appraise infestations of forest insect pests and tree diseases, to determine the measures which should be applied on such lands, in order to prevent, retard, control, suppress, or eradicate incipient, threatening, potential, or emergency outbreaks of such insect or disease pests, and to plan, organize, direct, and carry out such measures as he may deem necessary

to accomplish the objectives and purposes of this act: Provided, That any operations planned to prevent, retard, control, or suppress insects or diseases on forest lands owned, controlled, or managed by other agencies of the Federal Government shall be conducted with the consent of the agency having jurisdiction over such land.

Sec. 3. The Secretary of Agriculture may, in his discretion and out of any money made available pursuant to this act, make allocations to Federal agencies having jurisdiction over lands held or owned by the United States in such amounts as he may deem necessary to retard, control, suppress, or eradicate injurious insect pests or plant diseases affecting forests on said lands.

Sec. 4. No money appropriated to carry out the purpose of this act, shall be expended to prevent, retard, control, or suppress insect or disease pests on forest lands owned by persons, associations, corporations, States, Territories, possessions, or subdivisions thereof until such contributions toward the work as the Secretary may require have been made or agreed upon in the form of funds, services, materials, or otherwise.

Sec. 5. There are hereby authorized to be appropriated for the purpose of this act such sums as the Congress may from time to time determine to be necessary. Any sum so appropriated shall be available for necessary expenses, including the employment of persons and means in the District of Columbia and elsewhere, printing and binding, and the purchase, maintenance, operation, and exchange of passenger-carrying vehicles, but such sums shall not be used to pay the cost or value of any property injured or destroyed. Material and equipment necessary to control, suppress, or eradicate infestations of forest insects or tree disease may be procured without regard to the provisions of section 3709 of the Revised Statutes (41 U. S. C. 5) under such procedure as may be prescribed by the Secretary of Agriculture, when deemed necessary in the public interest.

Sec. 6. The provisions of this act are intended to supplement, and shall not be construed as limiting or repealing, existing legislation.

Sec. 7. This act may be cited as the "Forest Pest Control Act."

Approved June 25, 1947.

VII. A CHECKLIST OF THE REGION'S SERIOUS FOREST INSECTS AND DISEASES

	Insects	Diseases
1.	MOUNTAIN PINE BEETLE *Dentroctonus monticolae* Hopk.	WESTERN DWARFMISTLETOE *Arceuthobium campylopodum* forma *campylopodum* (Engel.) Gill
2.	SPRUCE BUDWORM *Choristoneura fumiferana* (Clem.)	SOUTHWESTERN DWARFMISTLETOE *Arceuthobium vaginatum* forma *cryptopodum* (Engel.) Gill
3.	ASPEN LEAF TIER *Sciaphila duplex* (Wlsh.)	DOUGLAS-FIR DWARFMISTLETOE *Arceuthobium douglasii* Engelm.
4.	LARGE ASPEN TORTRIX *Choristoneura conflictana* (Wlk.)	LODGEPOLE PINE DWARFMISTLETOE *Arceuthobium americanum* (Nutt.) ex. Engelm.
5.	PINYON NEEDLE SCALE *Matsucoccus acalyptus* Herbert.	DWARFMISTLETOE OF LARCH *Arceuthobium campylopodum* forma *laricis* (Piper) Gill
6.	DOUGLAS-FIR BEETLE *Dendroctonus pseudotsugae* Hopk.	RED RING ROT *Fomes pini* (Brot. ex Fr.) Karst
7.	ENGELMANN SPRUCE BEETLE *Dendroctonus engelmani* Hopk.	ROOT AND BUTT ROT *Fomes annosus* (Fr.) Cke.
8.	GREAT BASIN TENT CATERPILLAR *Malacasoma fragile* (Stretch)	BROWN CRUMBLY ROT *Fomes pinicola* (Sw. ex Fr.) Cke.
9.	TUSSOCK MOTHS *Orgyia* spp and *Hemerocampa pseudotsugata* McD.	BROWN STRINGY ROT *Echinodontium tinctorium* Ell. and Ev.
10.	MEALYBUGS *Puto* spp.	ASPEN HEART ROT *Fomes igniarius* (L. ex Fr.) Kicky.
11.	ASPEN LEAF MINER *Phyllocnistis populiella* Chamb.	COMANDRA RUST *Cronartium comandrae* Pk.
12.	LODGEPOLE PINE NEEDLE MINER *Recurvaria milleri* Busck.	WESTERN GALL RUST *Peridermium harknessii* Moore
13.	TUBE MOTH *Argyrotaenia* sp	LIMB RUST *Peridermium filamentosum* Pk.
14.	FALL CANKER WORM *Alsophila pometaria* (Harris)	YELLOW WITCHES' BROOM *Melampsorella caryophyllacearum* Schroet.

Insects (Cont'd)	Diseases (Cont'd)
15. SPRING CANKER WORM *Paleacrita vernata* (Peck)	SPRUCE BROOM RUST *Chrysomyxa arctostaphyli* Diet.
16. FIR ENGRAVER *Scolytus ventralis* Lec.	ASPEN CANKER *Cytospora chrysosperma* Pers. ex. Fr. or *Valsa sordida* Nits.
17. WESTERN BALSAM BARK BEETLE *Dryocoetes confusus* Sw.	PINE NEEDLE CAST *Elytroderma deformans* (Weir) Darker
18. ENGRAVER BEETLES *Ips* spp.	ASPEN LEAF BLIGHT *Marssonina populi* (Lib.) Magn.
19. A GEOMETRID *Anacamptodes clivinaria* (Guenee)	DOUGLAS-FIR NEEDLE CAST *Rhabdocline pseudotsugae* Syd.
20. WHITE FIR NEEDLE MINER *Epinotia meritana* (Hein.)	
21. A LEAF TIER OF ASPEN *Compsolechia niveopulvella* (Chamb.)	
22. PINYON PITCH TWIG MOTH *Petrova* sp.	
23. PINE BUTTERFLY *Neophasia menapia* Feld.	
24. SAGEBRUSH DEFOLIATOR *Aroga websteri* Clarke	